## Self-renewal and scalability of human embryonic stem cells for human therapy.

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**Public Summary:**
Human embryonic stem cells (hESCs) can undergo unlimited self-renewal and retain the pluripotency to differentiate into all cell types in the body. Therefore, as a renewable source of various cell types, hESCs hold great promise for human cell replacement therapy. In this review, we discuss current progress and bottlenecks in developing hESCs into human therapy.

**Scientific Abstract:**
Human embryonic stem cells (hESCs) can undergo unlimited self-renewal and retain the pluripotency to differentiate into all cell types in the body. Therefore, as a renewable source of various cell types, hESCs hold great promise for human cell replacement therapy. While significant progress has been made in establishing the culture conditions for the long-term self-renewal of hESCs, several challenges remain to be overcome for the clinical application of hESCs. One such challenge is to develop strategies to scale-up the production of clinic-grade hESCs in xeno-free and chemically defined medium without inducing genomic instability. To achieve this goal, it is critical to elucidate the molecular pathways required to maintain the self-renewal, survival and genomic stability of hESCs. This article describes recent progress in addressing this challenge and discusses the strategies to improve the scalability of the production of hESCs by inhibiting their apoptosis.